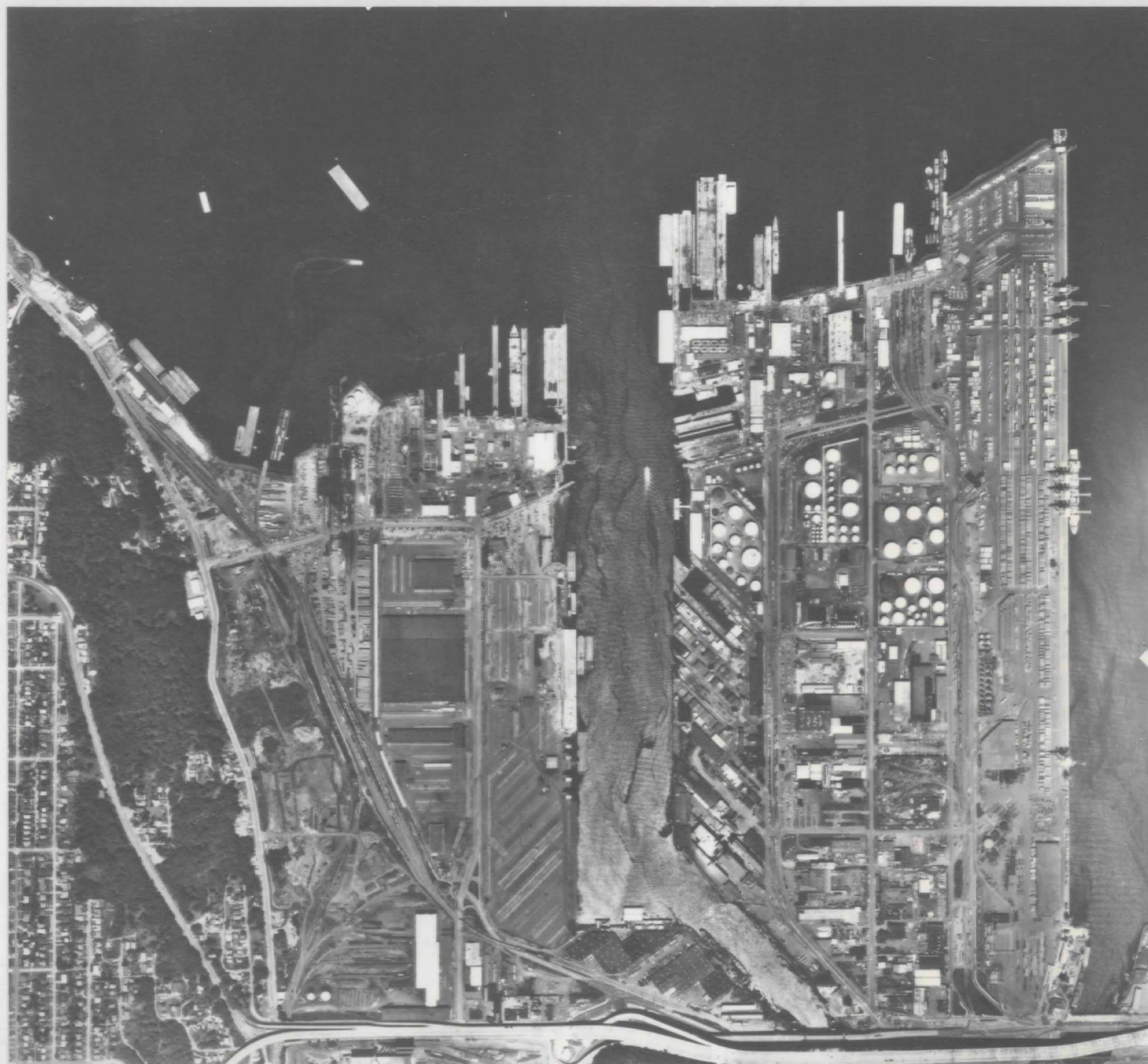


Aerial Photographic Property Study

Lockheed Shipbuilding and Construction Company

Seattle, Washington:
1936-1985



USEPA SF



1188797

H100 3

2.2.1

0002

48342

September 1988

**AERIAL PHOTOGRAPHIC PROPERTY STUDY
LOCKHEED SHIPBUILDING AND CONSTRUCTION COMPANY
SEATTLE, WASHINGTON: 1936 - 1985**

PREPARED FOR:

**MR. FRED H. REED, DIRECTOR
CORPORATE FIXED ASSETS, ENVIRONMENTAL AND SAFETY
LOCKHEED CORPORATION
4500 PARK GRANADA BOULEVARD
CALABASAS, CALIFORNIA 91399-0330**

PREPARED BY:

**LOCKHEED ENGINEERING & SCIENCES COMPANY
LOCKHEED ENVIRONMENTAL PROTECTION PROJECT OFFICE
1050 EAST FLAMINGO ROAD, SUITE 120
LAS VEGAS, NEVADA 89119**

SEPTEMBER 1988

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION AND SYNOPSIS	1
2.0 GENERAL HISTORY OF LOCKHEED SHIPBUILDING	1
3.0 ENVIRONMENTAL OVERVIEW	3
3.1 Shipyard 1	3
3.2 Regional Topography and Geology	3
3.3 Climate	6
3.4 Ground Water	6
4.0 FACILITY DESCRIPTION	7
5.0 ENVIRONMENTAL CONCERNS	7
5.1 Sandblasting	7
5.2 Painting	9
5.3 Wastewater and Runoff	9
6.0 DESCRIPTION OF TECHNIQUES	9
6.1 Evidence of Waste Release or Disposal	9
6.2 Historical Photographic Data	10
6.3 Principles of Analysis	10
6.4 Photographic Scale and Resolution	10
7.0 SUMMARY OF OBSERVATIONS FOR YARD 1	13
7.1 Observations for 1936	15
7.2 Observations for 1946	17
7.3 Observations for 1956	19
7.4 Observations for 1960	21
7.5 Observations for 1969	23
7.6 Observations for 1970	25
7.7 Observations for 1974	27
7.8 Observations for 1978	29
7.9 Observations for 1980	31
7.10 Observations for 1981	33
7.11 Observations for 1985	35

LIST OF FIGURES

	<u>Page</u>
FIGURE 1. Location of Shipyard 1 and Shipyard 2	2
FIGURE 2. General Plant Facilities - Shipyard 1	8
FIGURE 3. Image Interpretation Information Flow	12

LIST OF TABLES

TABLE 1. Major Facilities and Land Owners on Harbor Island	4
TABLE 2. Aerial Photography Specifications	11

LIST OF AERIAL PHOTOGRAPHS

PHOTOGRAPH 3-1. Major Facilities and Land Owners on Harbor Island	5
PHOTOGRAPH 7-1. 1936 Aerial Photographic Data	16
PHOTOGRAPH 7-2. 1946 Aerial Photographic Data	18
PHOTOGRAPH 7-3. 1956 Aerial Photographic Data	20
PHOTOGRAPH 7-4. 1960 Aerial Photographic Data	22
PHOTOGRAPH 7-5. 1969 Aerial Photographic Data	24
PHOTOGRAPH 7-6. 1970 Aerial Photographic Data	26
PHOTOGRAPH 7-7. 1974 Aerial Photographic Data	28
PHOTOGRAPH 7-8. 1978 Aerial Photographic Data	30
PHOTOGRAPH 7-9. 1980 Aerial Photographic Data	32
PHOTOGRAPH 7-10. 1981 Aerial Photographic Data	34
PHOTOGRAPH 7-11. 1985 Aerial Photographic Data	36

1.0 INTRODUCTION AND SYNOPSIS

Lockheed Corporation has retained the Lockheed Environmental Protection Project Office of Lockheed Engineering and Sciences Company (LESC) to conduct an aerial photographic property study of Lockheed Shipbuilding and Construction Company (LSCC) in Seattle, Washington. The primary objective of this investigation is to provide a chronology of site development and activity, including any visible material or waste disposal and handling practices, waste types, facility construction patterns, site expansion areas, environmental contaminant routes, and surrounding land use patterns.

The study area is the LSCC Shipyard 1 in Seattle (Figure 1). Shipyard 1 is located on the west side of Harbor Island and fronts an arm of the Duwamish River.

This report will provide input for a historical review of waste handling practices, part of an overall environmental assessment being performed at the LSCC facility by outside consultants. Some work has been completed to review regulatory documents and interview past and present employees who can identify past practices that may have resulted in environmental contamination. These investigative techniques are very useful and contribute greatly to knowledge about the facility.

The use of historical aerial photographs to gain information on facilities development and waste and material handling practices also provides a unique and valuable environmental perspective. Highly detailed site information can be gained by assembling, processing, and analyzing historical imagery to locate, identify, and characterize change and its significance.

The report provides temporal views of the facility of Lockheed Shipbuilding Yard 1 using aerial photographs taken over the area from 1936 through 1985.

2.0 GENERAL HISTORY OF LOCKHEED SHIPBUILDING AND CONSTRUCTION COMPANY

The Lockheed predecessor in Seattle-based shipbuilding was the San Francisco Bridge Company, a general waterfront contractor involved in pier, dock, and wharf building activities and dredging. Capitalizing on the need for transportation to the Alaska gold fields, the company began to build paddle-wheeler steam ships. In 1899, the company changed its name to Puget Sound Bridge and Dredging Company (PSBD) and kept that name for the next 60 years. PSBD began building ships for the U.S. Government around 1920 and continued in this business through 1959 when the company was sold to Lockheed. In addition to ships and other vessels built for the government, PSBD had built dams, bridges, breakwaters, missile bases, and highways in the United States and throughout the world.

After Lockheed acquired PSBD in 1959, the name was changed to Puget Sound Bridge and Drydock Company and then finally to Lockheed Shipbuilding and Construction Company (LSCC) in 1965. The major business of the modern

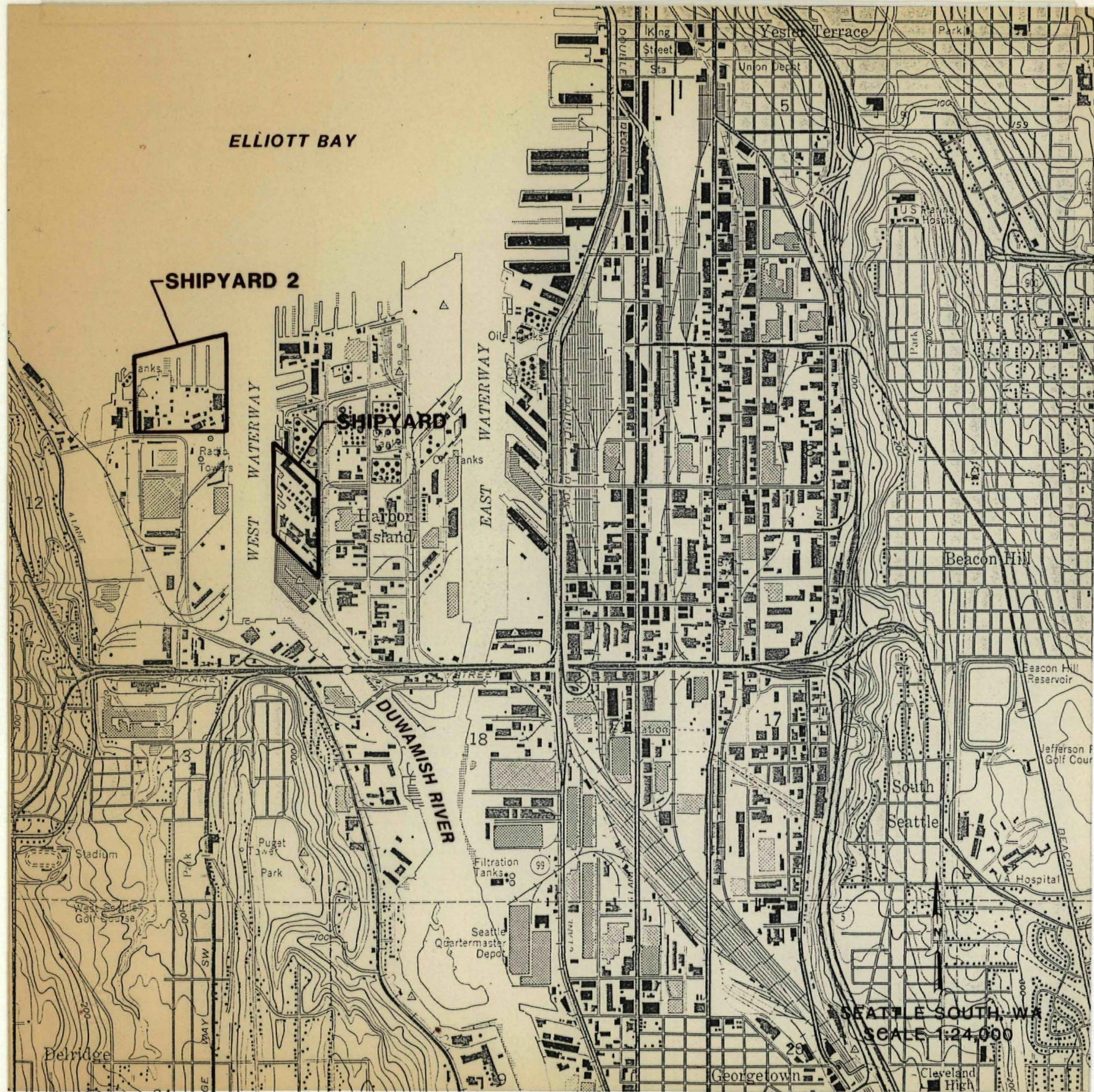


Figure 1. Location of Shipyard 1 and Shipyard 2. Scale, 1 inch equals 2000 feet.

company is building, overhaul, and repair of ships for the U.S. Navy. In addition to Navy vessels, LSCC has built ferries, cargo barges, ice breakers (for the U.S. Coast Guard), hydrofoils, and bulk carriers. Since 1981, LSCC ship repair has been extremely active with overhaul of a number of U.S. Navy ships, including destroyers. LSCC also operates facilities in Gulfport, Mississippi, and Savannah, Georgia, where the company builds air-cushion landing craft and utility ships for the U.S. Navy and Army.

3.0 ENVIRONMENTAL OVERVIEW

3.1 Shipyard 1

Shipyard 1 is located on Harbor Island, a 45-acre island created in the early 1900's from sedimentary fill dredged from the lower Duwamish River and West Waterway. Construction and right-of-way development in the Seattle area also provided fill for creation of the island. Harbor Island is now the largest manmade island in the world and is occupied by a variety of commercial and industrial land use activities including bulk oil storage, lead smelting, cargo handling, rail transport, and metal processing.

Table 1 lists a number of major land ownerships and facilities on Harbor Island. This list is keyed to Photograph 3-1, which shows the location of these facilities in relation to Shipyard 1. The only surface water associated with Harbor Island is the surrounding (receiving) waters of the Duwamish River (West Waterway) and Elliott Bay. Although ground water and other hydrogeologic factors on Harbor Island have only recently begun to be characterized, the situation is expected to be complex because the site is a dredge and fill island at the outlet of a major river. Variability in the thickness, compaction, and composition of fill material comprising the island complicates hydrogeologic characterization. Tidal effects and river flow dynamics also are expected to influence the ground-water system significantly.

3.2 Regional Topography and Geology

The Elliott Bay area falls within a broad physiographic area of Washington known as the Pacific Border Province. Within this province lies the area known as the Puget Lowlands, a broad drift plain which extends from the Cascade Mountains on the east to the Olympic Mountains to the west. This plain has moderate relief ranging from 200 to 700 feet in elevation and is transected by many steep-walled alluviated and marine embayments, the largest of which is Puget Sound. These embayments divide the Puget Lowlands into isolated remnants or uplands. Elliott Bay is essentially a walled alluviated embayment at the mouth of the Duwamish River.

The topography or surface expressions in the area are a product of glacial and glaciofluvial processes as a result of the Pleistocene age Vashon Glacier. Uplands are basically till or drift plains with small segments of exposed glaciated bedrock. The stream courses in this drift plain are

TABLE 1
MAJOR FACILITIES AND LAND OWNERS ON HARBOR ISLAND

<u>Code</u>	<u>Facility</u>
1	ARCO
2	Asahipen America, Inc.
8	Clean Sound Cooperative
9	Columbia Northwest Corp.
15	Fisher Mills, Inc.
16	Fisher Properties Inc.
19	Harbor Island Machine Works, Inc.
20	Hardware Specialty Co.
22	J. Meldelsohn & Sons
23	Key Industries Liberty
24	Kipper & Sons Engineers, Inc.
25	KMPS AM & FM
26	Knappton Maritime Corp.
30	Lockheed Shipbuilding and Construction Co.
31	Lone Star Industries, Inc.
34	Mobil Oil Corp.
36	Non-Ferrous Metals, Inc.
37	Pacific Molasses Co.
38	Pacific Rendering Co.
41	Port of Seattle
42	Pruzan Building Co.
46	Seafab Metal Corp.
48	Seattle Iron & Metals Corp.
50	Seattle Stevedore Co.
52	Shell Oil Co.
54	Texaco, Inc.
56	Todd Shipyard Corp.
57	Union Pacific Corp.
58	Value Metal Plating
61	Waste Recovery, Inc.
64	Shultz Distributing, Inc.
66	Alaska Lumber & Pulp Co.
70	Clough Industries, Inc.
76	Global Diving and Salvage
81	McCall Oil and Chemical
82	Mono Roofing Co.
84	Olympia Pipeline Co.
85	Pacific Wire Works
87	Performance Contracting, Inc.
88	Pilgrim Pet Supply
89	Puget Sound Tug & Barge
93	Seaport Petroleum
96	Harbor Island Marina Associates
123	Imagineering, Inc.
137	Alaska Hydro Train, North Star Forwarding
153	Safway Steel Products
154	Wycoff Industries

00

ॐ
८५

Photograph 3-1. Major facilities and Land Owners on Harbor Island.
Approximate scale, 1 inch equals 1000 feet.

poorly defined and lakes or sumps occupy local closed depressions or kettles. Linear ridges or drumlins in the drift plain are another surface feature left by the Vashon Glacier.

Elliott Bay lies at the end of the Duwamish Valley. This valley extends from Auburn, Washington, north to Elliott Bay at Seattle. This old marine embayment was filled and upgraded to slightly above sea level by the Green, Black and White Rivers. The White River was diverted to the south in 1906 and now joins with the Puyallup River to flow into Commencement Bay at Tacoma. The Black River joins with the Green River just west of Renton, Washington, to form the Duwamish River. The Duwamish River becomes the Duwamish Waterway at the point where the river has been dredged and channelized. The waterway extends from near the south end of King County International Airport to Elliott Bay.

The Puget Lowlands are underlain by semiconsolidated and unconsolidated materials which include clay, silt, sand, gravel, and glacial till. In some places these material exceed 2,000 feet in depth. For the most part, the material were deposited during Recent Pleistocene and Tertiary time. The Pleistocene deposits are glacial drift from the Vashon Glacier. The subsurface materials vary widely in degree of permeability, from high in the strata of coarse sands or sand and gravel, to low in the strata of clay, silt, fine sand, and till.

3.3 Climate

The Harbor Island area has a marine climate characterized by mild, wet winters and cool, dry summers. Precipitation is generally heavy during the winter months and lightest in the summer. The average yearly rainfall in the study area is about 38 inches, most of which falls as rain.

Winter temperatures are mild with frosts occurring rarely. The average minimum temperature in this area is 35°F. Summer temperatures are also mild with average highs in the low 70's. The diurnal ranges, both in winter and summer, generally are near 20°F.

3.4 Ground Water

The general availability of ground water within the region depends on the particular physiographic areas being considered. In the areas of glaciated bedrock the availability is very low (1 to 50 gpm). In the upland drift plains, ground water availability can vary from 1 or 2 gpm to several thousand gpm, depending on the type of material penetrated by the well. Many wells completed in glacial till have inadequate yields in the summer.

In the Duwamish Valley, ground water availability also depends on the subsurface material. As the water table is near the ground surface, most shallow wells will produce adequate domestic water supplies. These wells are completed in fine-grained sand and silt deposits. In some areas, however, coarse gravel deposits can yield over 3,000 gpm and could be used for municipal water supplies.

In the Duwamish Valley the water table is generally less than 10 feet beneath the surface but in local areas can be as much as 20 feet. In the upland areas the piezometric surface lies some 100 to 250 feet beneath the land surface. In some places the upland water table is as much as 125 feet above the adjacent valley floor, and the flow is toward the valley.

4.0 FACILITY DESCRIPTION

Shipyard 1 is located at 2929 16th Avenue S.W. on Harbor Island (Figure 2). The site covers approximately 30 acres, excluding parking, satellite storage areas, and the unit assembly building (Building 314), all located east of the site across 16th Avenue S.W. Yard 1 contains the administrative headquarters for LSCC. Neighboring facilities include Fisher Mills (grain processing and storage) to the south, the Arco tank farm (bulk petroleum storage) to the north, the metal processing and smelting facilities to the east.

Ship-related activity was present on the south half of the site as early as 1936, although the modern facility had its beginning with the construction of the new Puget Sound and Dredging Company Shipyard 1 in 1940. In the mid-1960's, Shipyard 1 took on the general arrangement it maintains into the present with the conversion of the older shipway, slab, and drydocks to modern ship construction facilities.

Yard 1 consists of administrative buildings, electrical substations, various technical support buildings for storage, maintenance, operations, and fabrication and development, and the ship construction areas including shipways, slabs, piers, and cranes, and craneways. Two rail spurs enter Yard 1 from Burlington Northern tracks paralleling 16th Avenue S.W.

5.0 ENVIRONMENTAL CONCERNS

In 1984, LSCC contracted for an environmental review of operations at Yard 1. The review addressed a number of management and technical issues related to current operations. Results of the review included an evaluation of wastewater treatment and control, air emissions and control, management systems, and contract hazardous waste disposal.

In terms of aerial photographic analysis of the LSCC property, the wastewater treatment and air emissions issues assume greater importance because these issues are likely to manifest themselves in ways that are amenable to overhead observation. For example, fugitive deposition of residuals from sandblasting and spray painting operations may be identified on historical imagery. In terms of wastewater, spills or leaks frequently leave behind persistent evidence of their occurrence.








5.1 Sandblasting

Historically, large quantities of a dark-toned, granulated material (grit) was used at Yard 1 for abrasive cleaning and paint removal on ship hulls. Although more recent environmental control of spent abrasive grit at LSCC

PLANT FACILITIES

- 101 ADMINISTRATION BLDG.
- 102 ADMINISTRATION BLDG.
- 103 ERECTORY
- 104 GUNPO HOUSE
- 106 CLOCK TOWER
- 106 PLATE SHOP
- 107 WELD ROD STORAGE
- 108 MOLD LIFT BLDG.
- 110 MACHINE SHOP BLDG.
- 112 MAINTENANCE OFFICES, STOCK ROOM
- 113 COMPRESSOR HOUSE (BURY) SUBSTATION
- 114 PAINT SHOP/OFFICE BLDG.
- 116 WAREHOUSE NO. 2
- 117 SANDBLAST & PAINT FACILITY
- 118 WAREHOUSE NO. 3
- 119 BLUEPRINT & SUPPLY BLDG.
- 120 MAINTENANCE & ELECTRIC BLDG.
- 121 ELECTRIC SHOP
- 122 ELECTRONICS SHOP/BLDG.
- 123 TELEPHONE BLDG.
- 124 STEEL OFFICE (UNDER SHED)
- 125 WAREHOUSE NO. 4 (UNDER SHED)
- 126 MAINTENANCE STORAGE BLDG.
- 128 SHAPE PREPARATION FACILITY
- 130 N/C PLASMA CUTTING FACILITY
- 131 PAINT BLDG.
- 132 WHEELABRATOR BLDG.
- 133 SANDBLAST & PAINT FACILITY
- 134 BOILER HOUSE
- 135 MAINTENANCE PAINT SHOP BLDG.
- 137 SUBSTATION 4A & 4B
- 138 SUBSTATION 1A
- 139 SUBSTATION 7A & 7B
- 140 COMPRESSOR HOUSE
- 301 SURPLUS WAREHOUSE
- 311 WAREHOUSE NO. 5
- 314 UNIT ASSEMBLY BLDG.

SYMBOLS

-  BUILDINGS
-  WHIRLEY CRANES
-  CRANWAYS
-  PIERS
-  SLABS
-  SHIPWAYS
-  SUBSTATIONS

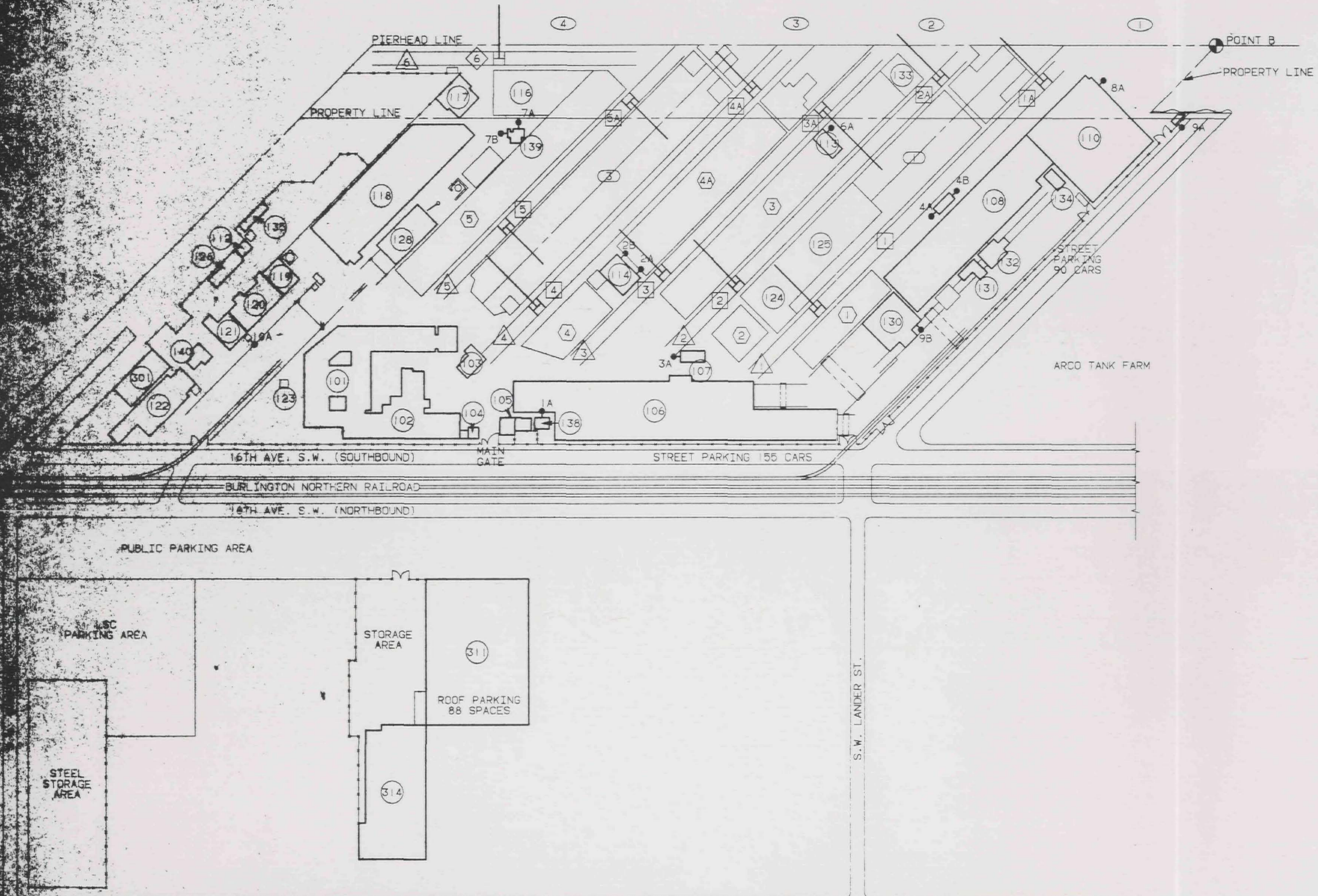
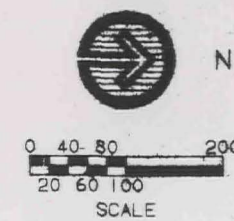


FIGURE 2

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES ON:		DEPARTMENT	3220	DATE	REV	DESCRIPTION	BY
FRACTIONS	1/2	DRAWN	EGM	4-10-66		LOCKHEED SHIPBUILDING COMPANY	
DECIMALS	.XX = .00	CHECKED				PLANT ENGINEERING	
	.XXX = .010	ENGINEER				2929 16TH AVENUE S.W. SEATTLE, WASHINGTON	
ANGLES	1/2	APPROVED					
THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF THE LOCKHEED SHIPBUILDING COMPANY AND EXCEPT FOR USES EXPRESSLY GRANTED TO THE UNITED STATES GOVERNMENT, LOCKHEED RESERVES ALL PATENT, PROPRIETARY, DESIGN, USE, SALE, MANUFACTURING, AND REPRODUCTION RIGHTS THEREIN. THIS DOES NOT APPLY TO VENDOR PARTS.		DEPARTMENT		DATE		GENERAL ARRANGEMENT PLANT ONE	
PLAN REVIEW - MECHANICAL MAINTENANCE	REVIEWED	DATE					
PLAN REVIEW - ELECTRICAL MAINTENANCE	REVIEWED	DATE					
FAB NO.		ERA NO.		SCALE	1"=100'0"	DWG. NO.	A-803

has been basically good (vacuuming, sweeping), past practices were much less effective. Deposition of spent abrasive and paint solids on shipways, paved areas, and on the water has occurred. Also, grit was washed off shipways and deposited in water when drydocks were flooded. Aerial imagery analysis indicates that grit deposits were widely dispersed across Yard 1 during the operational years. Submerged grit piles off shipways and piers appears to be a problem at Yard 1. Rain and runoff carry spent grit into waterways and storm drains. Site inspection by LESC-LV personnel in July 1988 indicated residual grit deposits remain in Yard 1.

5.2 Painting

Spray painting of ship hulls over and near water has resulted in paint solids being deposited on craneways, shipways, slabs, and on water. Aerial imagery analysis shows paint overspray on a shipway and paved area in Yard 1 as early 1960. Paint deposits were also observed in various other locations in Yard 1 during the study period.

5.3 Wastewater and Runoff

Open storage areas and certain buildings in Yard 1 have been the site of ground stains and spills during the aerial photographic study period. In particular, the pipe cleaning shelter has been the site of noticeable liquid discharges or spills to the ground.

Contaminated runoff and storm water are discharged from at least 16 separate sewers in Yard 1. It seems likely that some of the released or spilled material observed in Yard 1 during the study period has contaminated storm drains and/or reached Elliott Bay through surface runoff.

6.0 DESCRIPTION OF TECHNIQUES

Aerial photography provides a unique and synoptic perspective for locating and identifying environmental pollution. Through overhead observation of physical features, an investigator can quickly assess the magnitude or extent of the problem. Additionally, the assessment can be performed in areas where site size, access, or hazardous conditions preclude efficient ground-based observations.

6.1 Evidence of Waste Release or Disposal

Analysis of aerial photographs frequently provides evidence of hazardous waste release or disposal. Characteristic features include:

- Areas of pooled or standing liquid
- Ground discoloration
- Sheen on water surfaces
- Storage tanks or drums
- Surface impoundments and lagoons
- Point-source discharges and outfalls

- Landfills, solid waste dumps, mounded materials
- Pits, trenches, or excavations
- Vegetation stress or damage

6.2 Historical Photographic Data

Historical (archival) aerial photographs are a key component for characterizing hazardous and contaminated sites. This type of information can provide a chronology of site activity regarding disposal practices, types of wastes, expansion areas, access, site size, and boundaries. Historical photographs can remove the "disguise" of current facility developments and can uncover the definitive record of activity at many sites.

In order to document the course of facility development and material handling practices at the LSCC Yard 1 facility, photographs dating from 1936 through 1985 were obtained from a variety of sources. Table 2 provide specifications for the historical aerial photographs presented in this report.

6.3 Principles of Analysis

Stereoscopy is the basis of aerial photographic analysis. Photography is acquired as a series of overlapping frames along a predetermined ground track. The aerial film is viewed through a special instrument that optically reconstructs the ground scene in enhanced three-dimensional detail. Features thus observed can be identified on the basis of color, texture, size, shape, location, context, and association. The investigator then characterizes the scene. Observations are annotated on mylar overlays attached to the photos. An aerial photointerpretation code may be used to label waste-related features in aerial scenes of high complexity or large size. Figure 4 illustrates the image interpretation information flow involved in the production of this report.

6.4 Photograph Scale and Resolution

The two main variables to be considered in obtaining historical photographic data are scale and resolution. The larger the scale, the higher the resolution (visible detail in the aerial scene). If a large photographic scale is selected, however, more exposures are needed to cover a given area. A balance usually must be drawn between the size of the study area (number of exposures) and the size of the feature(s) of interest (resolution). Once an acceptable balance is reached, a photo acquisition plan can be developed. In this report, scale and resolution variables were predetermined by the available historical photographic data. However, each image presented in the report is an enlargement made from existing negatives or prints. These enlargements have been scale-mounted (to the extent possible) to facilitate interpretation and historical continuity.

TABLE 2
AERIAL PHOTOGRAPHY SPECIFICATIONS

<u>Aerial Flight Year</u>	<u>Acquisition Date</u>	<u>Nominal Scale</u>	<u>Original Data Type¹</u>	<u>Data Source²</u>
1936	Unknown	1:9,600	BW Print	Walker
1946	6/17/46	1:9,600	BW Print	Walker
1956	8/08/56	1:12,000	BW Print	Walker
1960	6/23/60	1:12,000	BW Print	Walker
1969	3/25/69	1:12,000	BW Print	Walker
1970	8/10/70	1:18,000	BW Print	WADNR
1974	3/20/74	1:18,000	BW Print	Walker
1977	4/22/77	1:18,000	BW Print	Walker
1978	5/31/78	1:12,000	BW Neg	WADNR
1980	4/27/80	1:18,000	BW Print	Walker
1981	7/16/81	1:12,000	BW Neg	WADNR
1985	6/19/85	1:12,000	BW Neg	WADNR

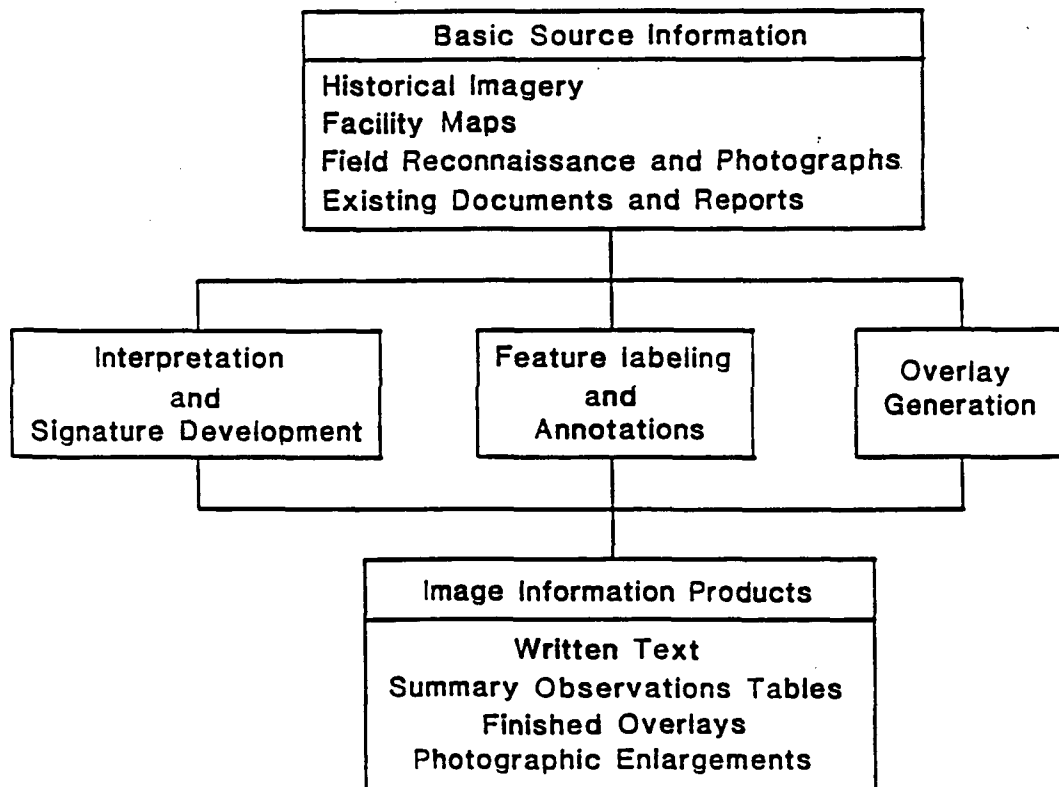
¹BW Print: Photographs in report copies are reproduced from black-and-white prints (internegative required).

BW Neg: Photographs in report are printed directly from black-and-white negatives (no internegative required).

²Walker: Walker and Associates, Inc., Photogrammetric Engineers, Seattle, Washington.

WADNR: State of Washington, Department of Natural Resources, Olympia, Washington.

FIGURE 3
IMAGE INTERPRETATION
INFORMATION FLOW CHART



7.0 SUMMARY OF OBSERVATIONS FOR YARD 1

Aerial photographic analysis spanned 49 years covering 1936, 1946, 1956, 1960, 1969, 1970, 1974, 1978, 1980, 1981, and 1985. Major facilities, development events, and on-site environmental conditions are summarized below:

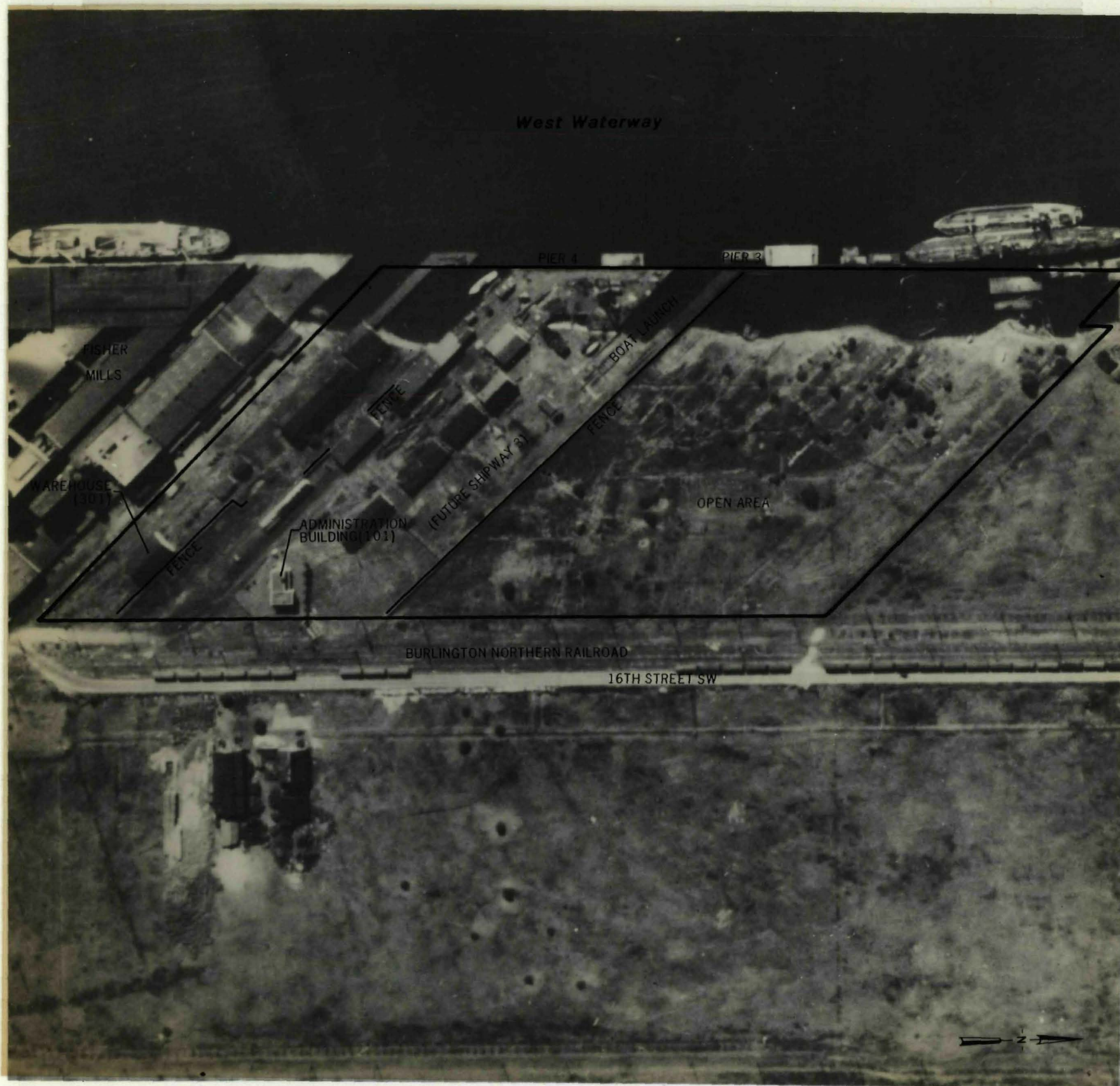
<u>Year</u>	<u>Facilities Development</u>	<u>On-Site Environmental Observations</u>
1936	An administrative building, warehouse, and boat launch are present on site; northern half of site is open and undeveloped.	No visible pollution sources.
1946	Major development of Yard 1 including seven larger buildings, two dry docks, one shipway, one slab.	No visible pollution sources.
1956	No significant change since 1946; removal of storage building.	Discharge from pipe into water at southwest corner of facility; grit observed on shipway and ground at south side of facility; minor ground staining. ✓
1960	Lockheed takes ownership of facility in 1959; no significant changes in Yard 1.	No grit deposits observed; continued point source discharge at southwest corner of facility; five small liquid-holding impoundments observed along south side of facility; light-colored standing liquid observed on slab; heavy ground stains at north side of facility. ✓
1969	Mid-1960's conversion of graving dock to shipway; addition of several major buildings and ship construction facilities including shipways, pier, slabs, craneways.	Minor ground staining; white ground discoloration on ground around Buildings 130; paint on ground near Building 131. ✓
1970	No significant changes.	Whitish-colored impounded liquids observed at south side of facility; grit deposits on Shipway 3, Slab 4A; minor ground staining. ✓
1974	No significant changes.	Moderately heavy grit on Shipway 1.

1978	Installation of three vertical storage tanks.	Grit observed on Shipways 1 and 3 and Slab 4; minor ground staining.	✓
1980	No significant changes.	No visible pollution sources.	
1981	No significant changes	Submerged grit piles observed at end of Slab 3 (Building 133) and Slab 4A; Slab 3 partially grit covered; minor ground stains; possible dust pile from blasting at Building 117.	✓
1985	Building 314 and satellite storage areas leased in 1983; no significant changes.	Grit observed on Shipway 3; grit partially submerged at west end Slab 4A.	✓

7.1 Observations for 1936

The earliest available aerial photograph taken over the future site of the Yard 1 facility shows that in the mid-1930's it was partitioned by a fence into an inactive open area on the north and an active facility to the south. Facilities that can be spatially correlate to present day development include Piers 3 and 4, administration building (Building 101), a warehouse (Building 301), and a boat launch (Shipway 3).

The Fisher Mills Plant is in existence to the south but the Arco (Richfield Oil) tank farm is not. Land east of the facility is vacant except for one set of buildings that appears to be for grain milling and storage. This site today is occupied by Pacific Rendering Company.



Photograph 7-1. Shipyard 1: 1936. Approximate Scale, 1 inch equals 250 feet.

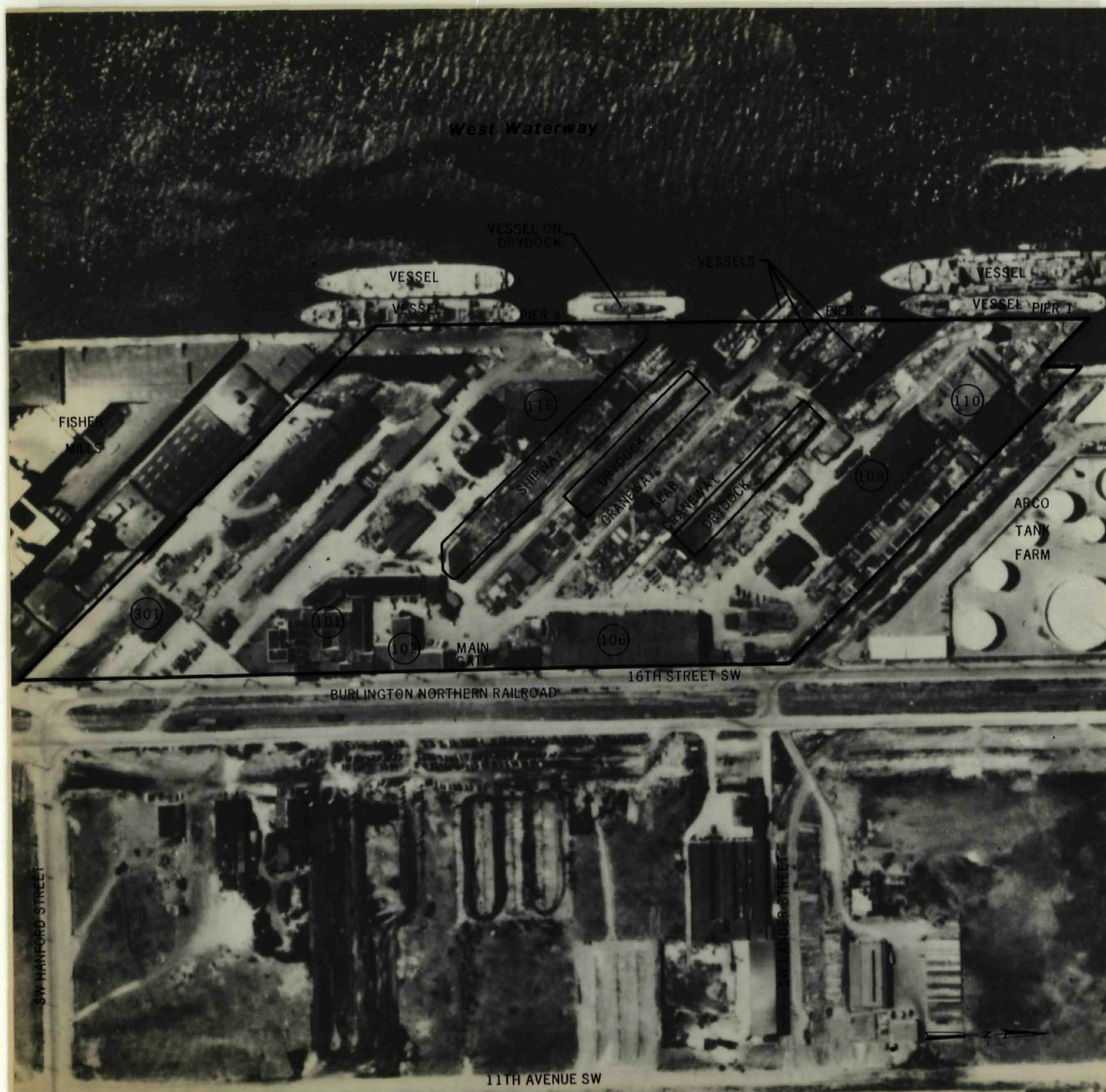
7.2 Observations for 1946

Major construction of the Yard 1 facilities on Harbor Island began in the spring of 1940 and was completed by mid-1941. Several of the main buildings occupying the site today were in place before 1946. Although not all these buildings may have served the function they do today, they have been identified on the photograph with the code that represents the use or purpose of each building at the present time to facilitate comparison with the entire historical photographic sequence. Present in 1946 were facilities that included:

- Building 101 and 102 (Administration)
- Building 106 (Plate Shop)
- Building 108 (Mold Loft)
- Building 110 (Machine Shop)
- Building 116 (Warehouse)
- Building 301 (Warehouse)

Pier 1 existed in its present day location and configuration. Pier 2 consisted of two pier structures (that would later be combined into one pier by a bulkhead). Pier 3 did not exist. Pier 4 existed in its present day location and form.

Also on site were a shipway, two dry docks, two craneways, and one slab. The shipway occupied present day Shipway 3; the southernmost dry dock occupied present day Shipway 4A; the slab, present day Slab 3; and the northernmost dry dock, present day Shipway 1.



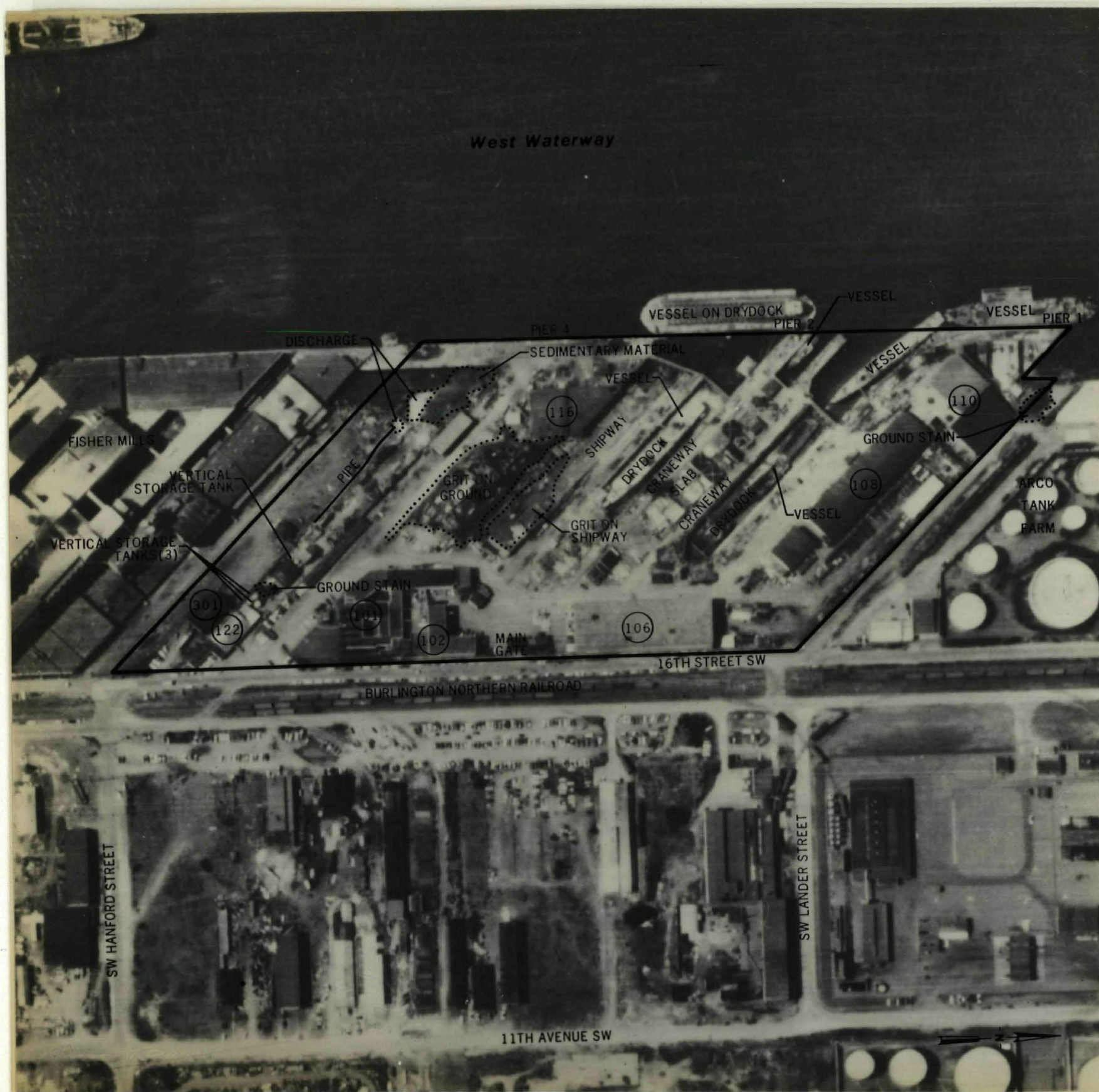
Photograph 7-2. Shipyard 1: June 17, 1946. Approximate Scale, 1 inch equals 250 feet.

7.3 Observations for 1956

The pattern of facilities development has not changed significantly since 1946 except for removal of one of the buildings located along the southern edge of the site.

Several sources of potential environmental contamination were noted across the site. Beginning along the south end of Yard 1 and moving north, the following were observed:

- ✓ Discharge from pipe - A whitish material is being discharged from a pipe or drainage line that appears to have its origin near a small building along the southern edge of the developed site. The discharge occurs on a low bank above the small water body impounded by Pier 4. Also associated with this water body is a sediment-like material piled along the banks, which partially fills the impounded area.
- ✓ Vertical storage tanks - Four tanks are located southeast of the pipe. A ground stain is associated with the cluster of three tanks.
- ✓ Sandblasting activity - What appears to be abrasive grit is spread across a portion of a shipway and heavily covers the ground immediately to the south.
- ✓ Ground stain - A heavily stained area is partially located on the Yard 1 property just north of Building 110.



Photograph 7-3. Shipyard 1: August 8, 1956. Approximate Scale, 1 inch equals 265 feet.

7.4 Observations for 1960

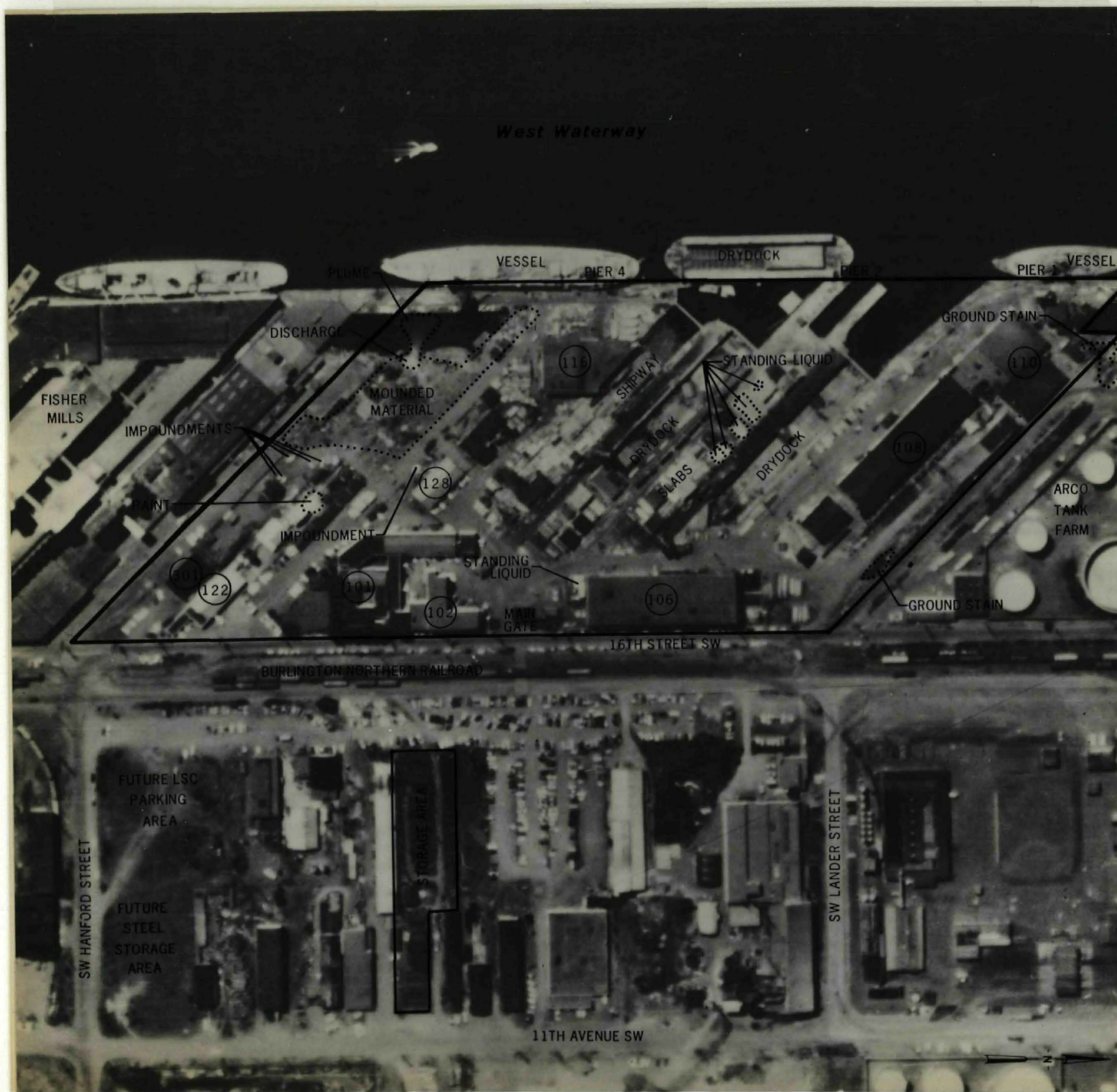
Since 1956, little overall change has taken place on the Yard 1 facility. The property was purchased by Lockheed in 1959. There has been no significant addition of buildings or changes in the shipway and dock areas. A steel storage area is now located across 16th St. SW from Yard 1. Some smaller unidentified buildings have been removed south of Building 116. The area southeast of Building 116 that was heavily grit covered in 1956 is now clear of grit and is occupied by three small unidentified buildings. Grit is not observed anywhere on Yard 1. However, others sources of potential contamination are visible in the following areas:

✓ Discharge point - The discharge point observed in 1956 is still active at the south end of the property, although the above ground pipe from which the discharge emanated in 1956 is not visible. The location of the discharge point has not changed.

✓ Impoundments - Five small impoundments or ground depressions holding a whitish colored liquid are located along the south end of Yard 1. Another standing liquid area is located at the southwest corner of Building 106. This liquid is also very light-toned and appears to be held in place by a low berm. On the slab between the two dry docks are five additional areas of light-toned standing liquid that appears to be held or contained in some way.

✓ Paint - A paint deposit is located adjacent to a small building west of Building 122.

✓ Ground stains - Two areas of heavy ground staining are located along the northern edge of Yard 1.



Photograph 7-4. Shipyard 1: June 23, 1960. Approximate Scale, 1 inch equals 250 feet.

7.5 Observations for 1969

Between 1960 and 1969, the Yard 1 facility took on the general layout and development it maintains today. In addition to a variety of new buildings and functional areas constructed since 1960, conversion of the older shipway, dry docks, and the slab to the present day arrangement occurred during this period.

New Buildings Developed Since 1960

Building 117 (Sandblast and Paint)	Building 133 (Sandblasting and Paint)
Building 118 (Warehouse)	Building 106 (Expansion of Plate Shop)
Building 119 (Blue print and Duplicating)	Building 311 (Warehouse)
Building 120 (Maintenance and Electric)	Building 314 (Unit Assembly)
Building 130 (NC Plasma Cutter)	Building 112 (Maintenance Office)
Building 131 (Paint Building)	Building 126 (Maintenance Storage)
Building 132 (Wheelabrator)	Building 114 (Paint Shop/Office)
	Building 107 (Weld Rod Storage)

Ship construction facilities developed since 1960

Slabs 1, 2, 3, 4A and 5
Shipways 1 and 3

Craneways 1, 2, 3, 4 and 5
Pier 3

Evidence of improper material handling includes:

- ✓ - A spill/ground stain east of Building 301
- ✓ - Extensive paint deposits on the ground around Buildings 131 and 117.
- ✓ - A whitish ground discoloration around Building 130 (original nature unknown).

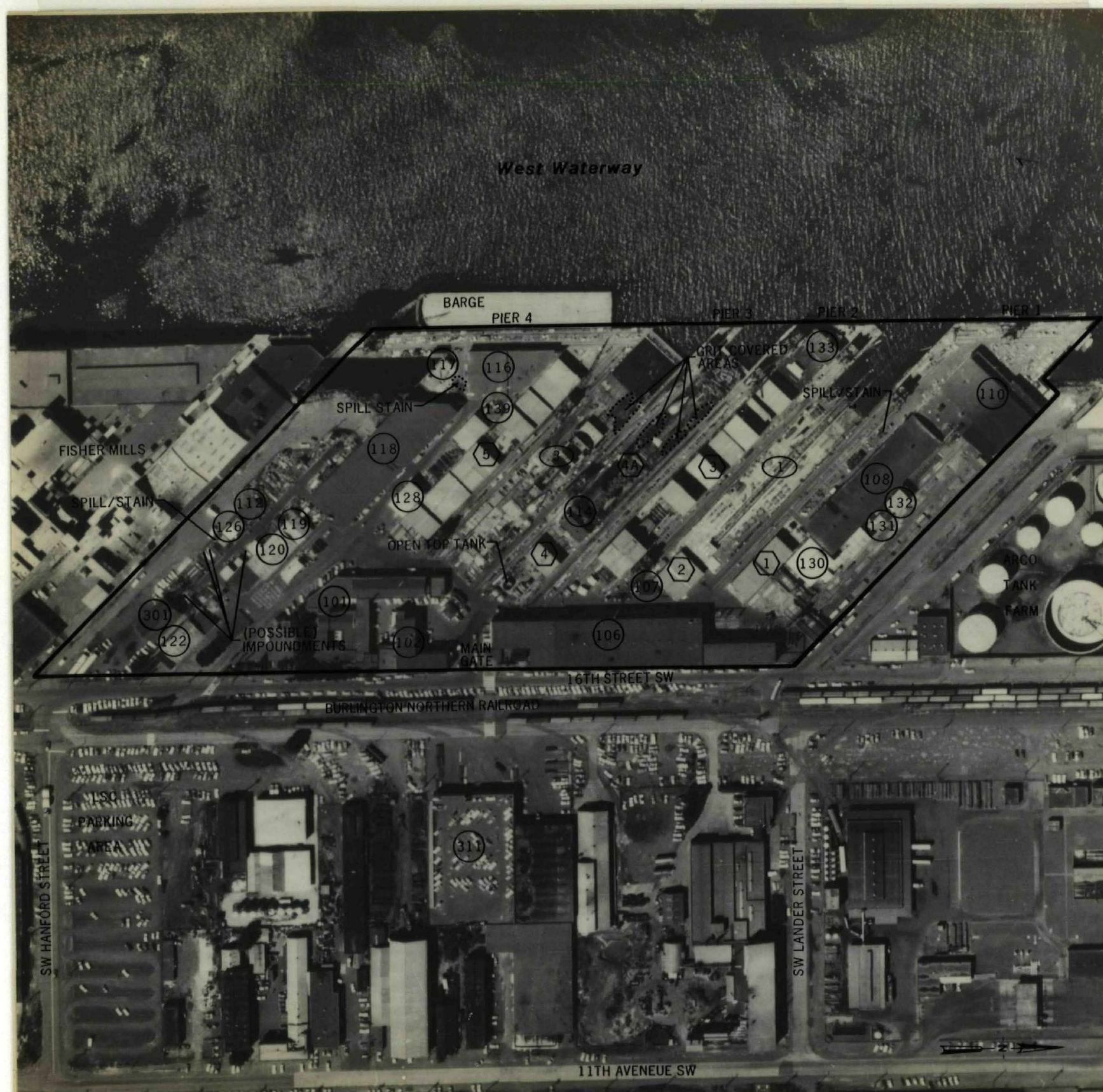


Photograph 7-5. Shipyard 1: March 25, 1969. Approximate Scale, 1 inch equals 265 feet.

7.6 Observations for 1970

There has been no major change in facilities development since 1969. Evidence of possible environmental contamination was observed in the following locations:

- ✓ Spills/ground stain - Two areas were observed. The first is east of Building 126 and the second is between Building 108 and Craneway 1.
- ✓ Abrasive grit deposits - Grit covered areas were observed on Shipway 3 and Slab 4A.
- ✓ Impoundments (possible) - Four small areas were observed near the south end of the facility that appear to impoundments or depressions containing a very light-toned liquid.

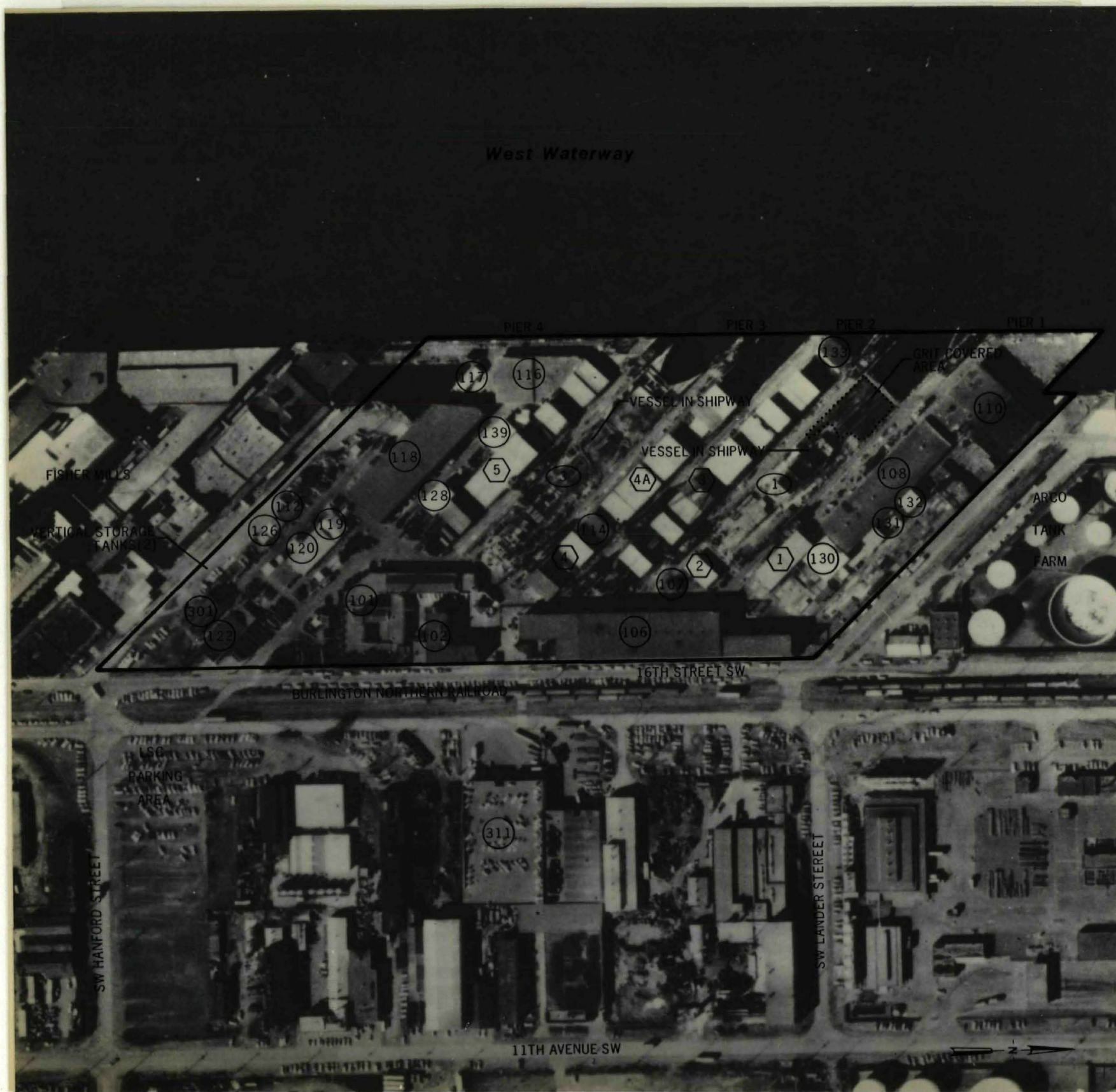


Photograph 7-6. Shipyard 1: August 10, 1970. Approximate Scale, 1 inch equals 250 feet.

7.7 Observations for 1974

No substantial changes have occurred in Yard 1 facilities since 1970. Ship construction activity is high with vessels under construction in Shipways 1 and 3.

The west end of Shipway 1 is covered with a moderately heavy layer of grit.



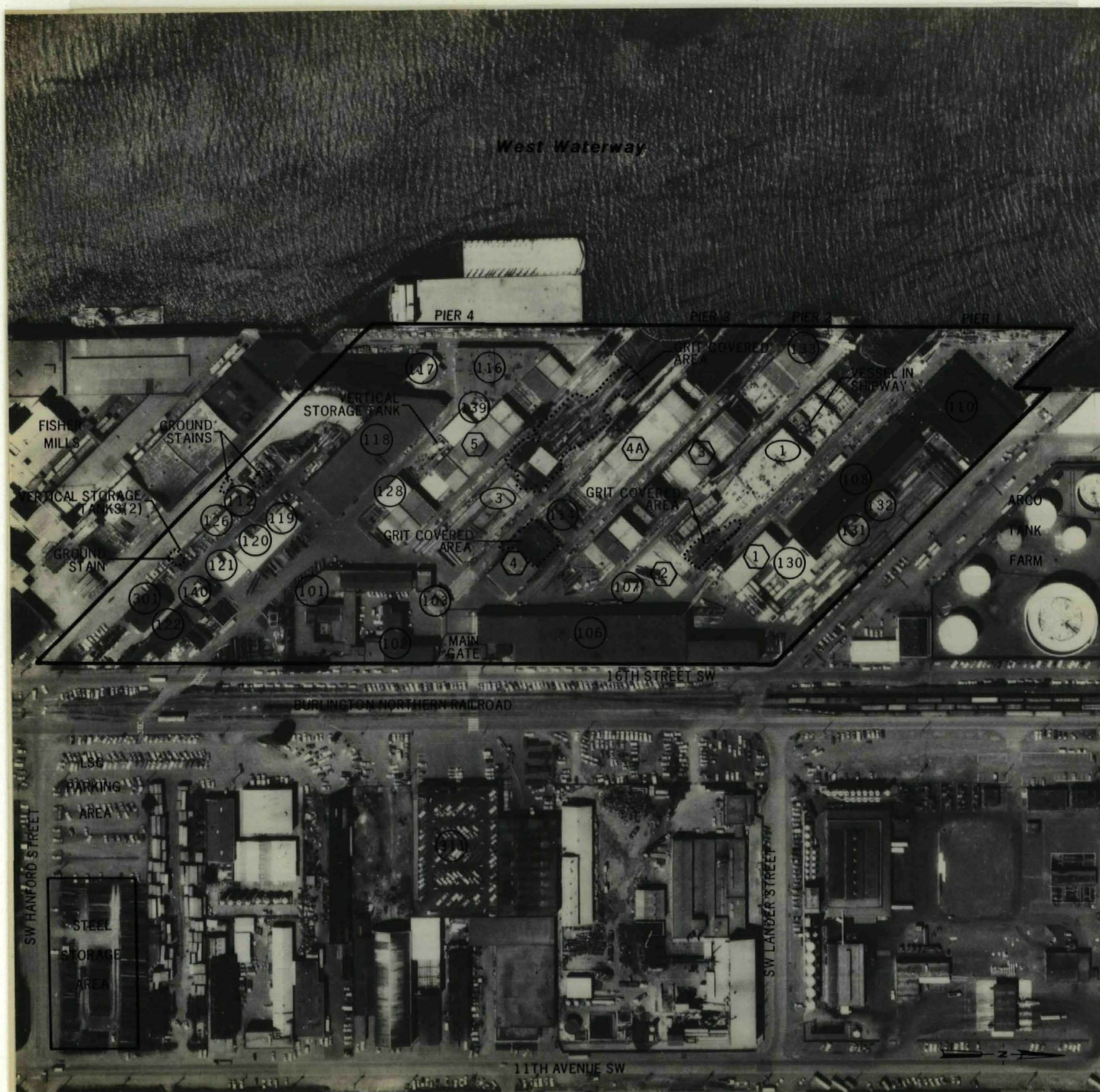
Photograph 7-7. shipyard 1: March 20, 1974. Approximate Scale, 1 inch equals 260 feet.

7.8 Observations for 1978

No major changes in facilities development have occurred since 1974 except for installation of three vertical storage tanks. Two tanks are now located between Buildings 301 and 126. The third is east of Building 139, adjacent to Slab 5.

✓ Ground stains are located along the southern perimeter of the property including an area directly adjacent to the storage tanks.

✓ Grit covered areas were observed on Shipways 1 and 3 and on Slab 4.

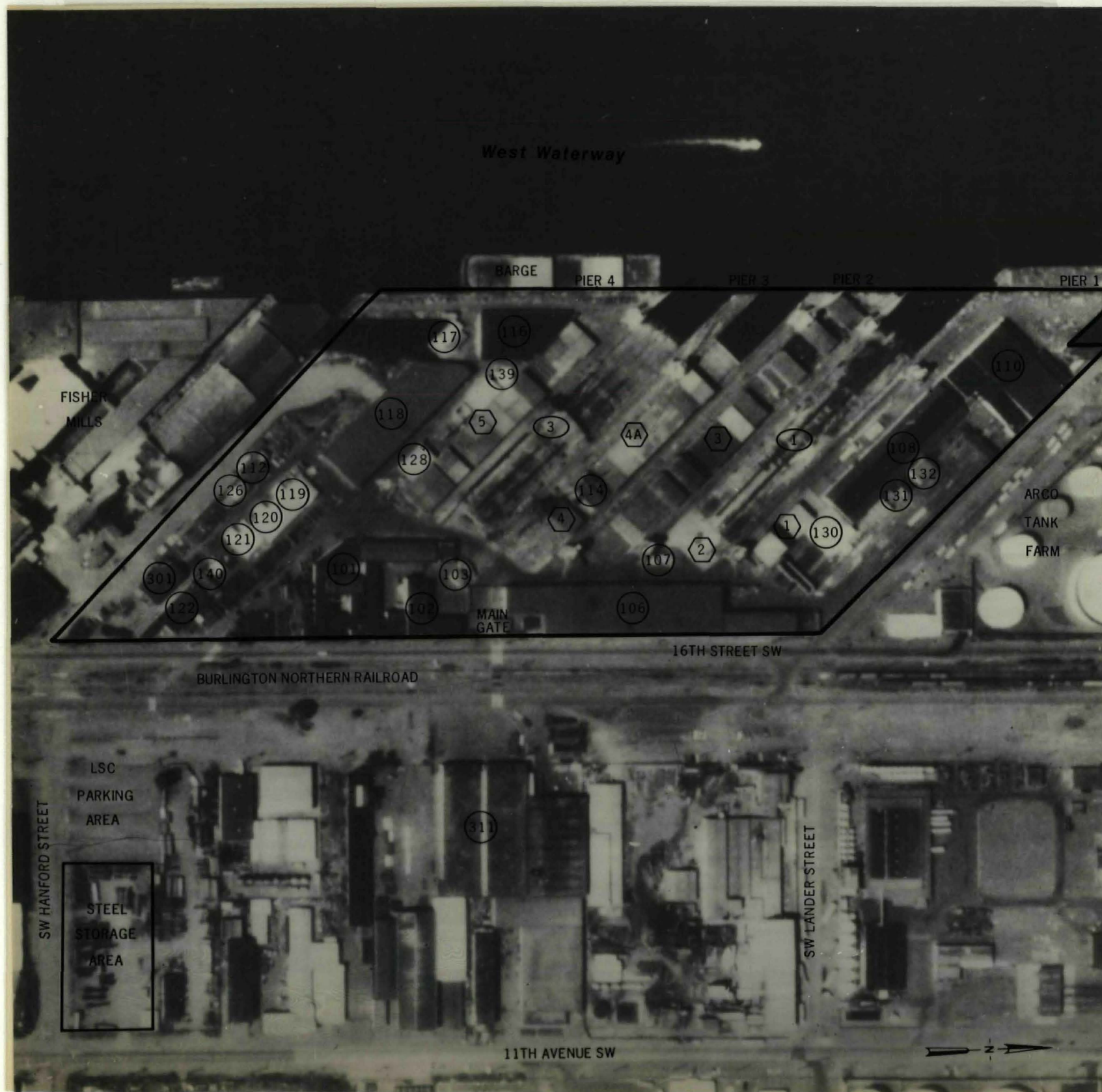


Photograph 7-8. Shipyard 1: May 31, 1978. Approximate Scale, 1 inch equals 250 feet.

7.9 Observations for 1980

In the years since the preceding photograph, no appreciable changes can be noted in the pattern of facilities development in Yard 1.

There are no visible pollution sources noted on the facility.



Photograph 7-9. Shipyard 1: April 27, 1980. Approximate Scale, 1 inch equals 250 feet.

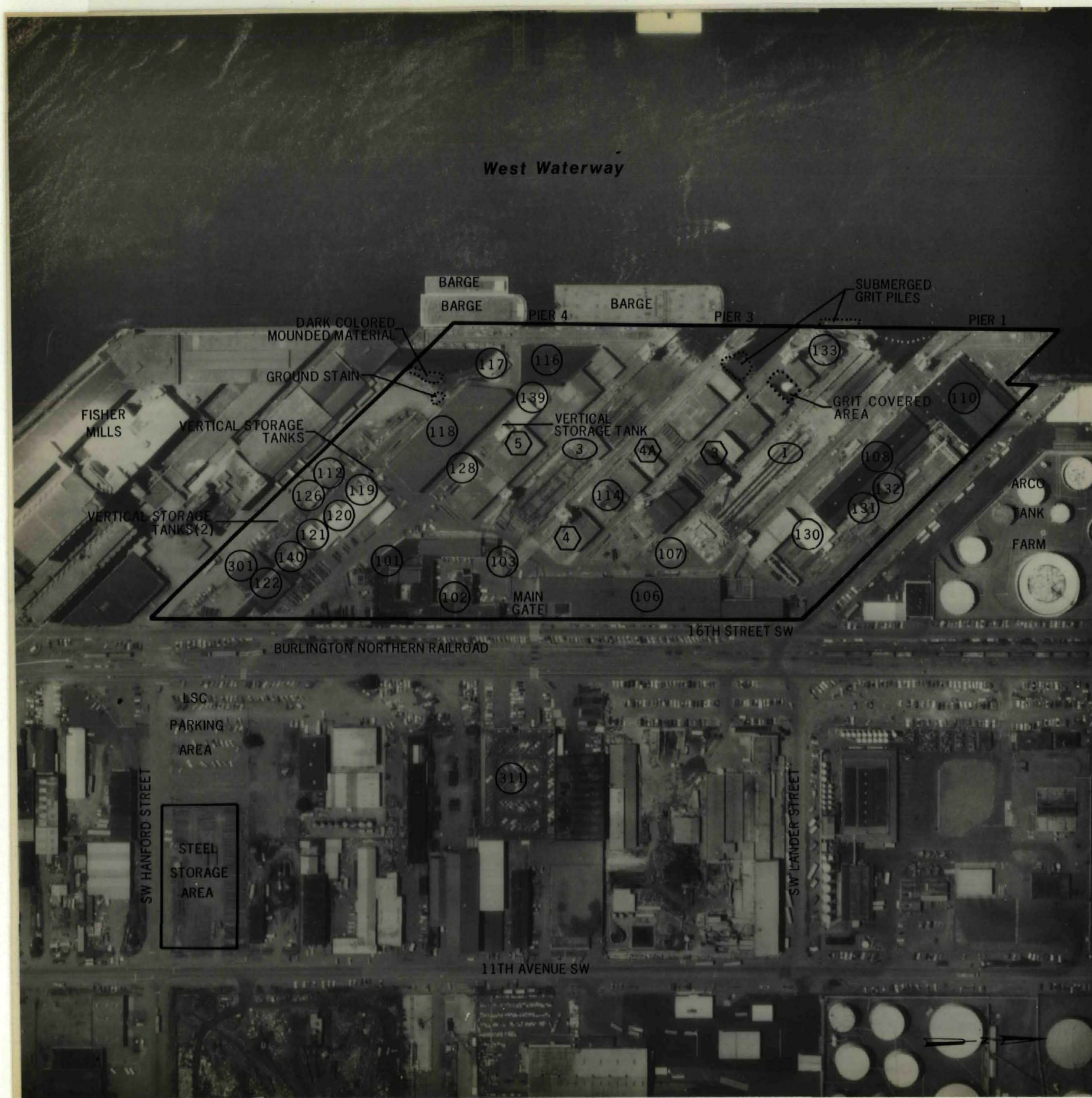
7.10 Observations for 1981

No notable facility development changes are observed since 1980.

✓ 4A. Submerged grit piles were observed at the west end of Slab 3 and slab. Additionally, a heavy grit layer covers a portion of the Slab 3 surface.

✓ An unidentified dark-colored, mounded material is piled adjacent to the open water area south of Building 117. This material has been identified by LSCC personnel as possible fugitive dust from steel shot blasting in Building 117.

✓ A ground stain is located on the south side of Building 118.

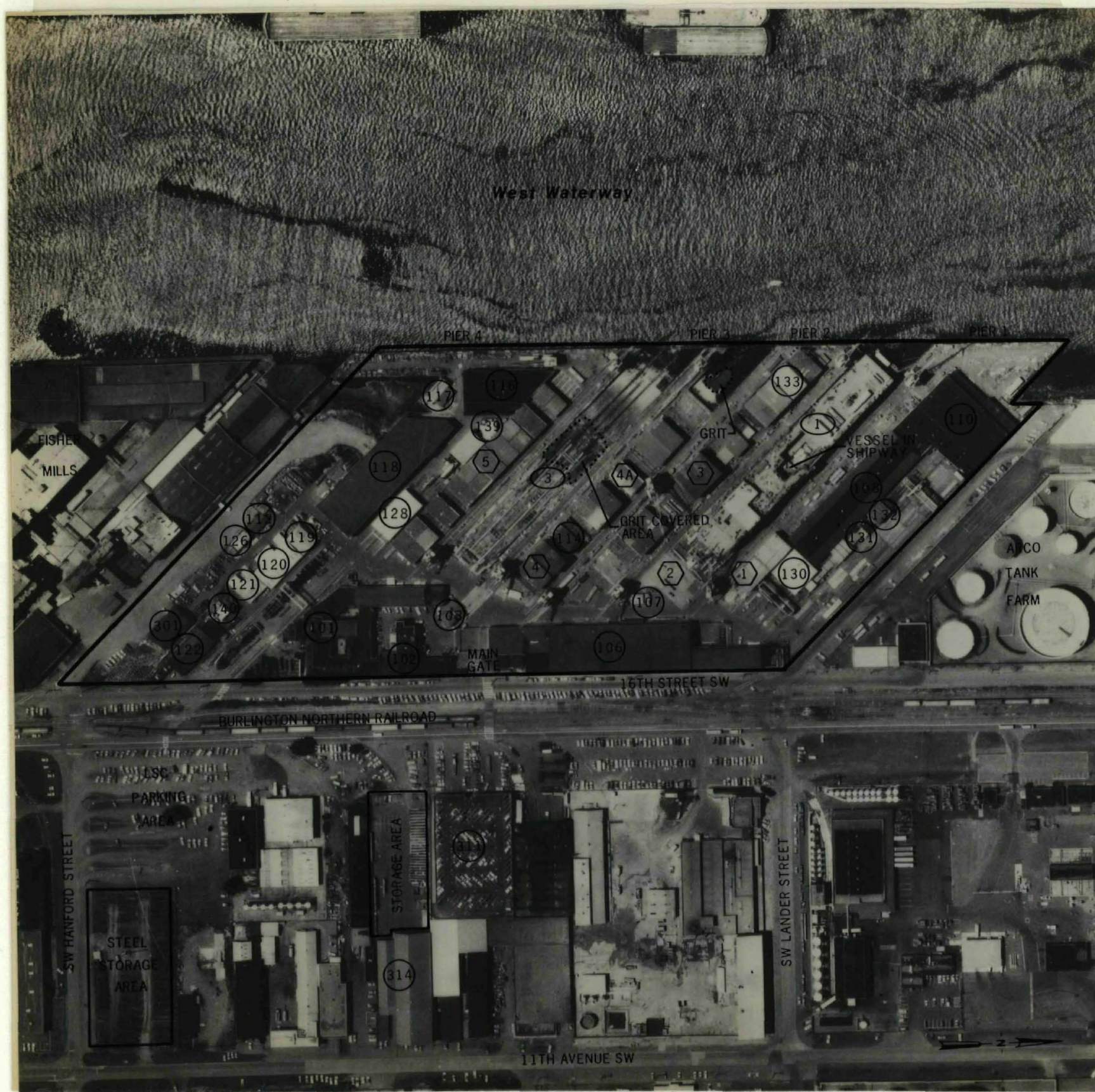


Photograph 7-10. Shipyard 1: July 16, 1981. Approximate Scale, 1 inch equals 285 feet.

7.11 Observations for 1985

The latest available aerial photograph of Yard 1 indicates no notable changes in facilities status since 1981. One vessel is under construction in Shipway 1. Building 314 and the other satellite storage facilities were leased in 1983 by Lockheed.

√ Grit deposits were observed in Shipway 3 and at the west end of Slab 4A. The deposit west of Slab 4A appears to be partially submerged.



photograph 7-11. Shipyard 1: June 19, 1985. Approximate scale, 1 inch equals 260 feet.